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(71) Applicant(s)

Samsung Electronics Co Limited  
(Incorporated in the Republic of Korea)  
416 Maetan-dong, Paldal-gu, Suwon-city,  
Kyungki-do, Republic of Korea

(72) Inventor(s)

Seog-Geun Lee  
Jeon-Man Park

(74) Agent and/or Address for Service

Dibb Lupton Alsop  
Fountain Precinct, Balm Green, SHEFFIELD, S1 1RZ,  
United Kingdom

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H04M 1/02, H04B 1/38

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G5C CA342 CA363 CHX  
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(58) Field of Search

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INT CL<sup>6</sup> H04B 1/38, H04M 1/02

(54) Abstract Title

**Folder-type mobile phone provided with a double-panel lcd**

(57) Two lcd's formed back to back provided in a folder-type mobile phone, mounted within the telephone whereby at least one face of the double-panel lcd is exposed even upon closing the folder.

The lcd's can either be driven in parallel with the same driver or a sensor can detect the position of the folder and generates a control signal to drive the appropriate driver of the visible lcd.

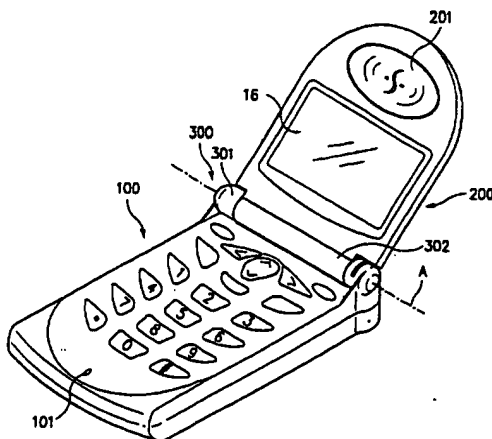


FIG. 1

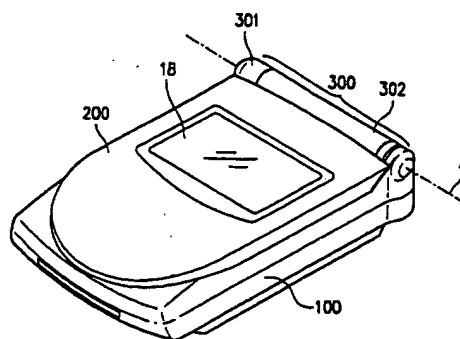


FIG. 2

At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

This print takes account of replacement documents submitted after the date of filing to enable the application to comply with the formal requirements of the Patents Rules 1995

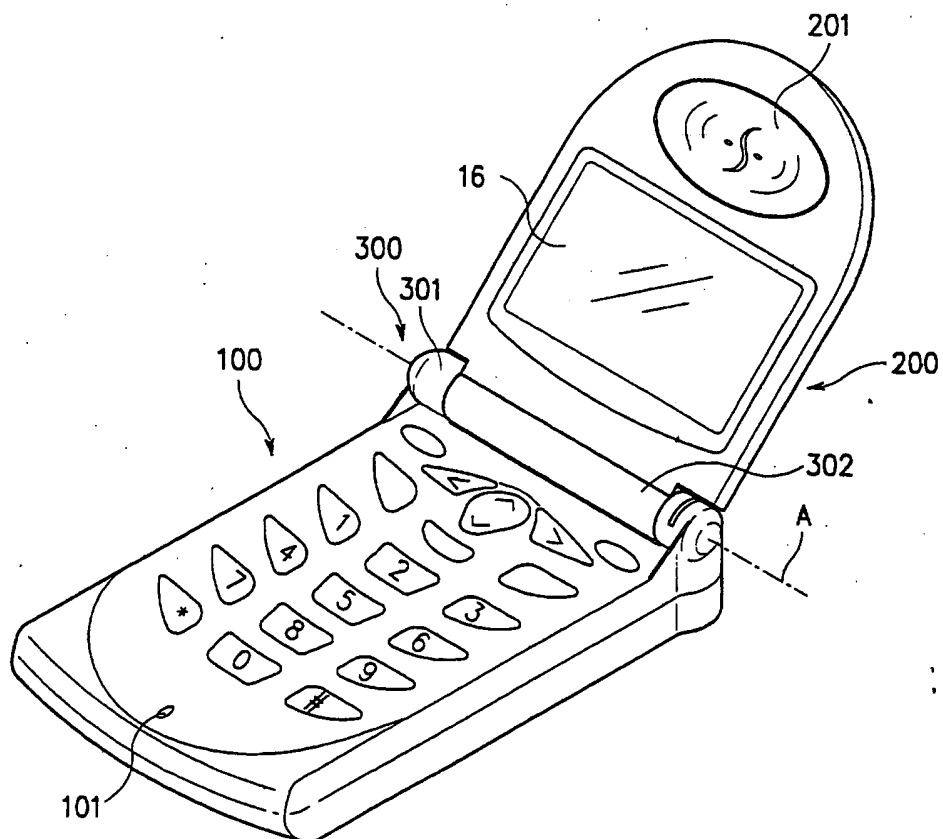


FIG. 1

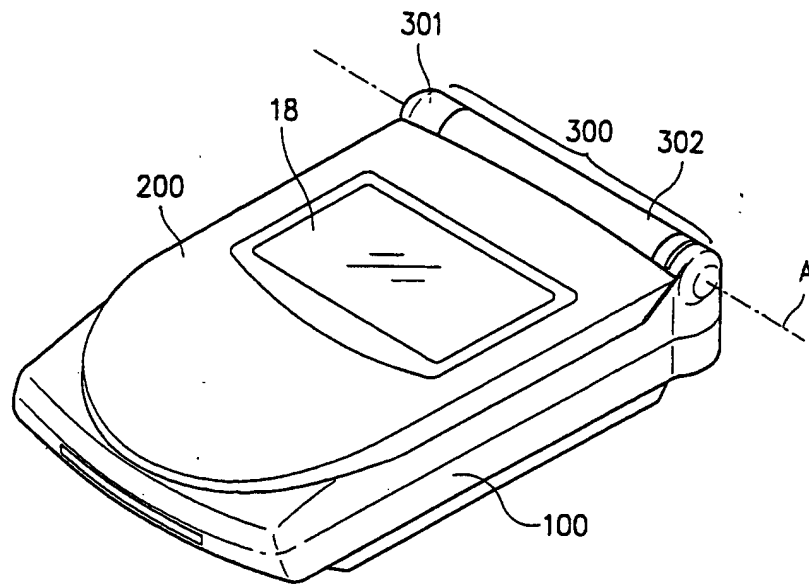


FIG. 2

FIG. 3

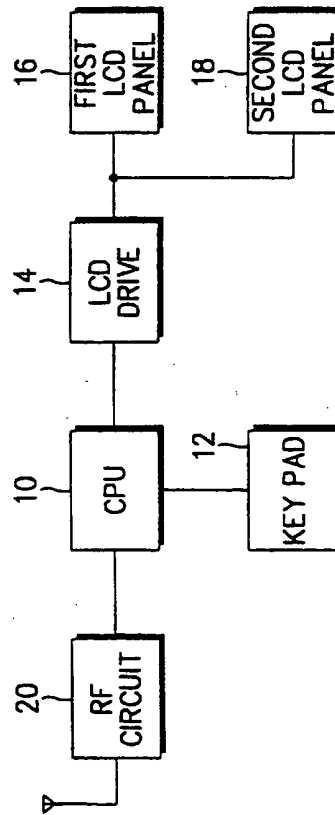
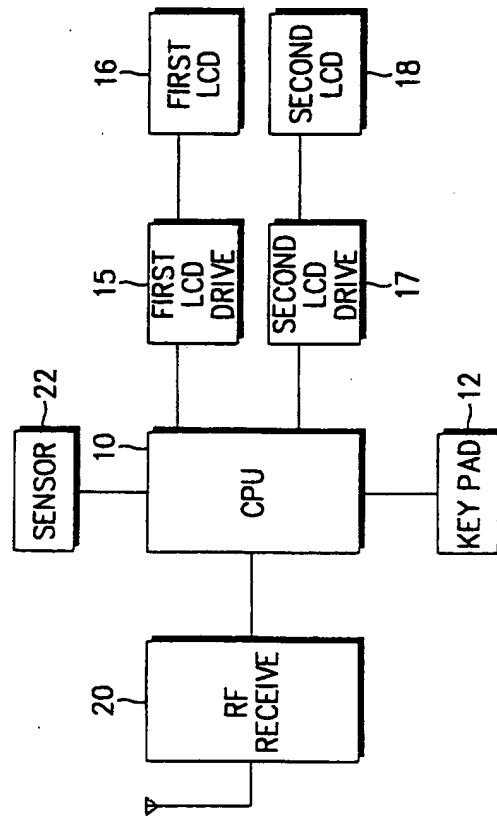


FIG. 4



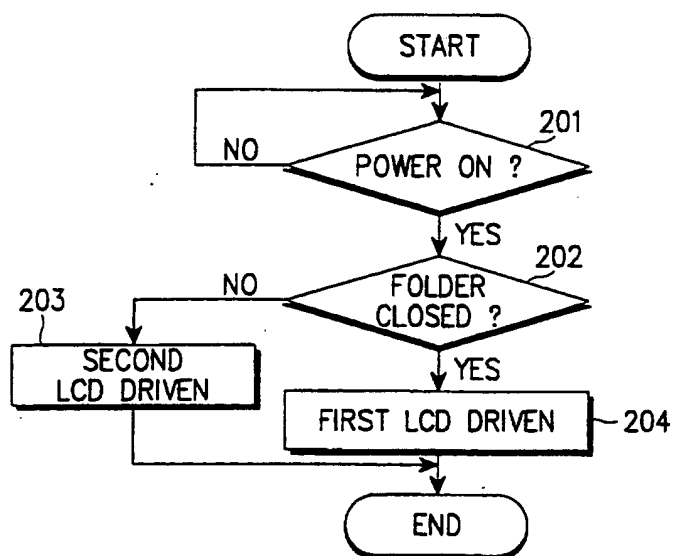


FIG. 5

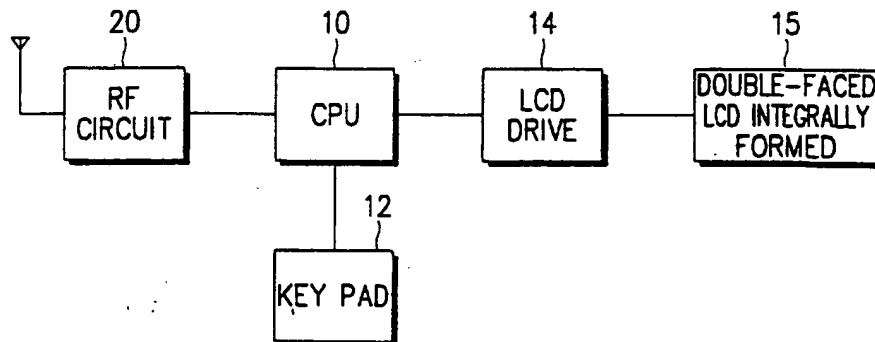


FIG. 6

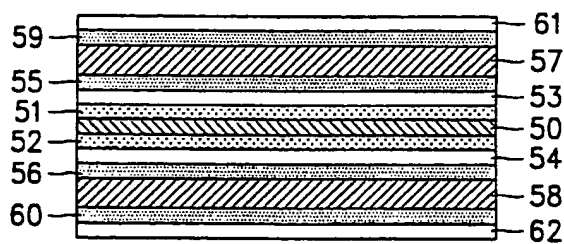


FIG. 7

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FOLDER-TYPE MOBILE PHONE PROVIDED WITH A DOUBLE-PANEL LCD

BACKGROUND OF THE INVENTION

1. Field of the Invention

5 The present invention relates to a folder-type mobile phone, and more particularly a novel arrangement of an LCD provided in a folder-type mobile phone.

2. Description of the related art

10 Folder type mobile phones include a folder part which acts as a lid or cover for a part of the body of the phone, usually for the part including the keypad. The folder is usually attached by means of a hinge to the body of the phone so that it can be  
15 moved between an open position in which the body of the phone (in particular, the keypad) is exposed and a closed position in which the body of the phone is covered by the folder. The folder may also include a microphone or speaker. Conventionally, a folder-type mobile phone is designed so that the LCD is  
20 exposed (and therefore viewable by the user) only when the folder is opened. Hence, the folder must necessarily be opened in order for the user to view the display which carries information relating, for  
25 example, to the operational state of the mobile phone such as the antenna icon for displaying the received electric field strength, present time, outreaching available communication area, battery charge remaining, various functional setting modes,  
30 etc.



## SUMMARY OF THE INVENTION

It is an object of the present invention to provide a folder-type mobile phone with a two-panel LCD that enables the user to view the operational state of the mobile phone even when the folder is closed.

According to a first aspect of the present invention there is provided a folder type mobile phone comprising first and second LCD panels, and an LCD drive for driving the first and second LCD panels, wherein

the first and second LCD panels are connected in parallel with the LCD drive and

said first and second LCD panels are mounted on the folder such that at least one of said panels is exposed even when the folder is in a closed position.

In one embodiment of this aspect of the invention the first and second LCD panels are respectively mounted on inner and outer surfaces of the folder. The first and second LCD panels may be arranged in a direct back-to-back arrangement or may be offset from one another. Preferably the folder includes a through aperture in which said first and second panels are mounted in back-to-back relation.

According to a second aspect of the present invention there is provided a folder type mobile phone comprising first and second LCD panels,

first and second LCD drives for respectively driving the first and second LCD panels,

a sensor operative to detect the position of the folder and to generate an open-state or a closed state signal in accordance with the open or closed position of said folder, and

- 5 a controller operative to generate a respective first LCD drive control signal or a second LCD drive control signal in accordance with the said open-state or closed-state signal,

wherein said first LCD drive drives the first LCD panel  
10 in response to the first LCD drive control signal and the second LCD drive drives the second LCD panel in response to the second LCD drive control signal.

In a particularly preferred embodiment of this second aspect of the invention, the first and second LCD panels  
15 are arranged on opposed sides of the folder such that at least one of the panels is exposed even when the folder is in a closed condition.

Preferably the panel exposed when the folder is in a closed condition is operative to provide a display  
20 indicative of the operational state of the phone.

According to a third aspect of the present invention, there is provided a folder-type mobile phone including an integral display unit comprising first and second opposed LCD panels wherein the integral display unit is mounted  
25 in a through aperture formed in the folder whereby at least one LCD panel of the display unit is exposed even when the folder is in its closed condition.

Most preferably, the individual elements of the first and second LCD panels of the display unit are formed

symmetrically on respective opposed sides of a common reflector plate.

In one embodiment of this third aspect of the invention, the first and second LCD panels are connected in parallel  
5 to a single LCD drive.

In an alternative embodiment of this third aspect of the invention, the first and second LCD panels are connected to respective first and second LCD drives.

The present invention will now be described more  
10 specifically by way of example only with reference to the attached drawings.

#### BRIEF DESCRIPTION OF THE ATTACHED DRAWINGS

Fig. 1 is a perspective view of the folder-type mobile phone of the invention with its folder opened;

15 Fig. 2 is a perspective view of the folder-type mobile phone of the invention with its folder closed;

Fig. 3 is a block diagram illustrating a circuit for driving a double-panel LCD provided in a folder-type mobile phone according to an embodiment of the present  
20 invention;

Fig. 4 is a block diagram illustrating a circuit for driving a double-panel LCD provided in a folder-type mobile phone according to another embodiment of the present invention;

25 Fig. 5 is a flow chart illustrating the process of controlling the circuit of Fig. 4;

Fig. 6 is a block diagram illustrating a circuit for driving a double-panel LCD provided in a folder-type mobile phone according to a further embodiment of the present invention; and

- 5 Fig. 7 is a cross sectional view of a double-panel LCD formed according to the further embodiment of the present invention.

#### DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to Figs. 1 and 2, a folder-type mobile phone  
10 comprises a main body 100, folder 200, and a hinge 300 for enabling the folder 200 to turn around its central axis "A". To this end, a pair of side arms 301 are formed on the upper edge of the main body 100 so as to cooperate with respective ends of the hinge 300. A key pad 12 is  
15 arranged on the upper surface of the main body 100, including alphanumeric keys, power key and various functional keys for data input. The microphone 101 is arranged below the key pad.

The ear piece with a speaker 201 is arranged in the upper  
20 part of the folder 100, and a double-panel LCD is arranged in the illustrated example in a through opening thereof. The double-panel LCD comprises a first LCD panel 16 arranged to face outwardly from the inner side of the folder 100, and a second LCD panel 18 arranged to face  
25 outwardly from the outer side of the folder 100, so that the data may be displayed on the first and/or second LCD panel 16 or 18 according to whether the folder is opened or closed. The first and second LCD panels need not necessarily be arranged directly back-to-back but may be  
30 offset with respect to each other.

Referring to Fig. 3, the CPU 10 controlling the whole functions of the mobile phone generates control signals for driving the LCD. The key pad 12 includes a plurality of alphanumeric keys and various functional keys. An LCD drive 14 is provided to drive the first and second LCD panels 16 and 17 to display information relating, for example, to the operational state of the mobile phone and dialing data in response to the control signals from the CPU 10. An RF circuit 20 modulates the sound signals inputted through the microphone 101 with a radio frequency, and demodulates the RF signals received through the antenna into the sound signals outputted through the speaker 201.

Describing the operation of the mobile phone according to the present embodiment in connection with Figs. 1 to 3, when the folder 200 is opened, and the power key pressed, information concerning the electric field strength received through the antenna is processed through the RF circuit 20, delivered to the CPU 10 to drive the LCD drive 14, which enables the first and second LCD panels 16 and 18 to display the icons representing the antenna and the received electric field strength together with other information such as the present time and date and the specific day of the week. In addition, the functional modes presently set may be displayed on the first and second LCD panels. In this case, the user may view all the information displayed on the first LCD panel 16. However, if the folder 200 is closed, the information may be viewed through the second LCD panel 18.

The embodiment illustrated in Figs. 4 and 5 is different from the previous embodiment in that the first and second LCD panels are respectively driven by first and second

LCD drives 15 and 17 according to first and second LCD drive control signals generated from the CPU 10. In addition, there is provided a sensor 22 for detecting the position of the folder 200 of the mobile phone to generate an open- or a closed-state signal representing whether the folder 200 is in an open position or a closed position. The open- and closed-state signals are delivered to the CPU 10. Thus, in operation, the sensor 22 generates the open- or closed-state signal applied to the CPU 10 to control the first or second LCD drive 15 or 17 according to whether the folder 200 is closed or open. Thus, depending on the position of the folder 200, the first or second LCD display panel 16 or 18 displays the information representing the operational state of the mobile phone such as the received electric field strength, time, date, dialing number, various functional modes, etc.

Referring more specifically to Fig. 5, when the power key of the main body 100 is pressed in step 201 so that the phone is turned on, the process goes to step 202 where the CPU 10 determines according to the state signal from the sensor 22 whether the folder 200 is closed or open. Thus, if the folder 200 is closed, the CPU 10 works the first LCD drive 15 to drive the first LCD panel 16 to display the information. However, if the folder 200 is open, the CPU 10 works the second LCD drive 17 to drive the second LCD panel 18 to display the information. Hence, the user may view the information by means of the first or second LCD panel regardless of whether the folder 200 is closed or open.

The further embodiment of Fig. 6 differs from the two previous embodiments in that the first LCD panel is

integrally formed with the second LCD panel so as to form a single unit double-panel LCD. Namely, in order to obtain the double-panel LCD 15, the previous embodiments have the first and second LCD panels separately formed while the present embodiment has the first and second panels integrally structured into a single unit. This single unit comprising the double-panel LCD is driven by a single LCD drive 14. Specifically describing the structure of the present double-panel LCD in connection with Fig. 7, the two LCD panels are integrally laid on respective sides of a central reflector plate 50. Sequentially deposited on one side of the reflector plate 50 are a back light plate 51, lower glass plate 53, lower electroluminescent plate 55, liquid crystal layer 57, upper electroluminescent plate 59 and upper glass plate 61. Likewise, similar layers 52, 54, 56, 58 and 60 are sequentially deposited on the other side of the reflector plate 50. Thus, the present embodiment requires only one reflector plate, which is different from the previous embodiments which require two reflector plates. This reduces the thickness and weight of the mobile phone. Of course, the single unit of the double-panel LCD of the present embodiment may be applied in the embodiment of Fig. 4. That is, the first and second LCD panels may respectively be driven by first and second LCD drives in dependance on signals received by the CPU from a sensor for detecting the open or closed position of the folder.

While the present invention has been described in connection with specific embodiments accompanied by the attached drawings, it will be readily apparent to those skilled in the art that various changes and modifications may be made thereto without departing the gist of the present invention.

## CLAIMS

1. A folder type mobile phone comprising first and second LCD panels, and  
an LCD drive for driving the first and second LCD  
5 panels, wherein  
the first and second LCD panels are connected in parallel with the LCD drive and  
said first and second LCD panels are mounted on the folder such that at least one of said panels is  
10 exposed even when the folder is in a closed position.
2. A mobile phone as claimed in claim 1 wherein said first and second LCD panels are respectively mounted on inner and outer surfaces of the folder.
- 15 3. A mobile phone as claimed in claim 1 wherein the folder includes a through aperture in which said first and second panels are mounted in back-to-back relation.
4. A folder type mobile phone comprising first and  
20 second LCD panels,  
first and second LCD drives for respectively driving the first and second LCD panels,  
a sensor operative to detect the position of the  
25 folder and to generate an open-state or a closed-state signal in accordance with the open or closed position of said folder, and



a controller operative to generate a respective first LCD drive control signal or a second LCD drive control signal in accordance with the said open-state or closed-state signal,

5 wherein said first LCD drive drives the first LCD panel in response to the first LCD drive control signal and the second LCD drive drives the second LCD panel in response to the second LCD drive control signal.

10 5. A mobile phone as claimed in claim 4 wherein the first and second LCD panels are arranged on opposed sides of the folder such that at least one of the panels is exposed even when the folder is in a closed condition.

15 6. A mobile phone as claimed in any of claims 1 to 5 wherein the panel exposed when the folder is in a closed condition is operative to provide a display indicative of the operational state of the phone.

20 7. A folder-type mobile phone including an integral display unit comprising first and second opposed LCD panels wherein the integral display unit is mounted in a through aperture formed in the folder whereby at least one LCD panel of the display unit is exposed even when the folder is in its closed condition.  
25

8. A mobile phone as claimed in claim 7 wherein the individual elements of the first and second LCD panels of the display unit are formed symmetrically on respective opposed sides of a common reflector plate.  
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